HOW IS A RADIATION ONCOLOGIST TRAINED?

A typical 5-year radiation oncology residency (United States) is designed to train physicians in the diagnosis, planning, and delivery of radiation therapy for cancer, while developing expertise in cancer biology, imaging, multidisciplinary care, research, and patient management.

Major components and their focus:

Clinical Radiation Oncology

Evaluation and management of patients with cancer, treatment planning, radiation delivery, follow-up care, toxicity management, and survivorship.

Disease Site Rotations

Training across major tumor types, including breast, lung, gastrointestinal, genitourinary, gynecologic, head and neck, central nervous system, lymphoma, sarcoma, pediatric cancers, skin cancers, and palliative oncology.

Medical Physics

Principles of radiation generation, dosimetry, treatment planning systems, quality assurance (QA), machine calibration, radiation safety, and imaging physics.

Radiobiology

Cellular effects of radiation, DNA damage and repair, fractionation, tumor biology, normal tissue response, radiosensitizers, and radiation protection.

Treatment Planning

Contouring targets and organs at risk, image fusion, dose constraints, IMRT, VMAT, SBRT, SRS, brachytherapy planning, adaptive radiotherapy, and plan evaluation.

Imaging

Interpretation and integration of CT, MRI, PET, ultrasound, and image-guided radiation therapy (IGRT) into treatment planning.

Procedural Skills

Brachytherapy procedures, simulation, immobilization, fiducial placement (where applicable), treatment verification, and management of radiation emergencies.

Multidisciplinary Oncology

Participation in tumor boards and collaboration with medical oncology, surgical oncology, pathology, radiology, palliative care, and other specialties.

Research & Scholarly Activity

Clinical, translational, or basic science research; quality improvement; manuscript preparation; presentations at scientific meetings.

Professional Development

Ethics, communication skills, leadership, quality improvement, patient safety, health equity, and practice management.
Board Examination Preparation Structured didactics, case conferences, journal clubs, mock oral examinations, and preparation for written and oral board certification exams.

Typical progression by year

PGY-1 (Preliminary Year)

* Usually completed in internal medicine, surgery, or a transitional year.
* Builds a foundation in general patient care, inpatient medicine, emergency management, and procedural skills.

PGY-2

* Introduction to radiation oncology.
* Fundamentals of consultation, simulation, contouring, treatment planning, and common disease sites.
* Core education in physics and radiobiology begins.

PGY-3

* Greater independence in managing common malignancies.
* Increased complexity in treatment planning.
* Participation in brachytherapy and stereotactic techniques.
* Research project development.

PGY-4

* Advanced disease site management.
* Leadership of multidisciplinary care.
* More sophisticated technologies such as adaptive radiotherapy, proton therapy (where available), and re-irradiation.

* Continued research productivity.

PGY-5 (Chief Resident Year)

* Near-independent management of complex patients.
* Supervising junior residents and teaching medical students.
* Chief resident responsibilities (at many programs).
* Completion of scholarly work and intensive preparation for board certification and independent practice.

Longitudinal experiences throughout residency

Residents typically participate in:

* Weekly disease-site conferences and tumor boards
* Medical physics and radiobiology lectures
* Morbidity and mortality conferences
* Journal clubs
* Quality improvement and patient safety initiatives
* Resident teaching sessions
* Research mentorship
* Professional development and wellness activities
* Increasing responsibility in outpatient continuity clinics

Core competencies developed

By graduation, a resident is expected to demonstrate competence in:

* Comprehensive oncologic patient evaluation
* Evidence-based radiation treatment selection
* Safe treatment planning and delivery
* Management of acute and late radiation toxicities
* Use of advanced radiation technologies (e.g., IMRT, VMAT, SBRT, SRS, brachytherapy)
* Effective multidisciplinary communication
* Scholarly inquiry and lifelong learning
* Professionalism, ethics, and patient-centered care

Overall, the curriculum integrates clinical oncology, medical physics, radiobiology, advanced technology, research, and professional development to prepare graduates for independent practice as board-certified radiation oncologists.